

**REMARKS**

Entry of the foregoing, reexamination and reconsideration of the subject application are respectfully requested in light of the amendments above and the comments which follow.

As correctly noted in the Office Action summary, claims 1-20 were pending. By the present response, claims 7, 10 and 11 have been amended, and claims 21-24 have been added. Thus, upon entry of the present response, claims 1-24 are pending and await further consideration on the merits.

Support for the foregoing amendments can be found at least at the following locations in the original disclosure: page 8, lines 13-25; and the original claims.

**CLAIM OBJECTIONS**

*OK* Claims 10 and 11 stand objected to on the grounds set forth on page 2 of the Official Action. By the present response, claims 10 and 11 have been amended in a manner which addresses the above-mentioned informalities, without narrowing the scope thereof. Thus, reconsideration and withdrawal of the objection is respectfully requested.

*OK* Claims 3, 4 and 5 are also objected to under 37 C.F.R. §1.75(c) on the grounds set forth on pages 2-3 of the Official Action. This objection is respectfully traversed.

Claims 3, 4 and 5 are objected to on the grounds that since these claims recite a specific surface area which is progressively smaller than the claims from which they

depend, they fail to further limit the scope of those claims from which they depend. This is incorrect.

The presently claimed invention is directed to a material characterized by a relatively high and thermally stable surface area. It is a well-observed phenomenon that the surface area of precipitated materials, such as those recited by the presently claimed invention, have a tendency to undergo a reduction in specific surface area with exposure to increasing temperatures. The materials of the presently claimed invention are specifically formulated to resist this tendency. Thus, for example, a zinc aluminate is defined by claim 1 as having a specific surface area of at least 85 m<sup>2</sup>/g after being calcined at at least 800°C for 8 hours. Claim 3, while reciting a somewhat lower specific surface area than the material defined by claim 1, from which it depends, also requires that this specific surface area be maintained after being calcined at 900°C for 2 hours. It is important to note that the calcining temperature recited in claim 3 is significantly greater than that required by claim 1. Similar observations can be noted with respect to the requirements of claims 4 and 5.

Thus, taken in light of the fact that there is a natural tendency for a reduction in specific surface area upon exposure to increasing temperatures, the assertion that claims 3-5 fail to further limit the subject matter of those claims from which they depend, is unfounded. Reconsideration and withdrawal of the objections are respectfully requested.

*CLAIM REJECTIONS UNDER 35 U.S.C. §112, FIRST PARAGRAPH*

*OK* Claim 1 stands objected to on the grounds set forth on page 2 of the Official Action. Namely, it is alleged that the amendment to claim 1, namely the insertion of "least at" after the term "at" constituted new matter. This assertion is respectfully traversed.

It is alleged on page 2 of the Official Action that the above-mentioned amendment to claim 1 constitutes new matter because "the limitation is not found at any other place in the specification." However, contrary to what is implied by this statement, 35 U.S.C. §112, first paragraph, does not require literal support for claim limitations within the specification.

Moreover, it is respectfully submitted that one of ordinary skill in the art would clearly have recognized the basis for the above-noted amendment to claim 1 in the contents of the original disclosure. For example, as previously explained, the presently claimed invention is directed to a material which exhibits a relative stability of specific surface area upon exposure to relatively high temperatures. This relationship is discussed, for instance, on page 5 of the original specification. From the discussion on page 5 of the original specification, it is clear that calcining temperatures in excess of 800°C are explicitly contemplated. Moreover, it is also readily apparent that the materials of the presently claimed invention may exhibit a specific surface area after exposure to high temperatures which is even greater than the 85 m<sup>2</sup>/g value recited in claim 1 (e.g. - see lines 5-7 of page 5). Thus, it is respectfully submitted that there is ample support for the previous amendment to claim 1, which specifies that the calcining temperature can be "at least at

800°C for 8 hours." Reconsideration and withdrawal of the rejection is respectfully requested.

***CLAIM REJECTIONS UNDER 35 U.S.C. §103(a)***

Claims 1-6 stand rejected under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 4,565,803 to Schoenthal et al. (hereafter "*Schoenthal et al.*") on the grounds set forth on page 4 of the Official Action. This rejection is respectfully traversed.

The presently claimed invention is directed to a material, associated methods, and associated methods of use, that are characterized by relatively high specific surface area which is stable even upon exposure to relatively high temperatures. As discussed, for example, on page 2 of the present specification, thermal stability of the surface area can be important characteristics in certain uses of these materials. In particular, there is a need in the art for spinel-type catalysts having a high specific surface area, even when exposed to relatively high temperatures, which are often encountered in catalytic environments.

According to a first aspect, claim 1 defines:

*1. Zinc aluminate, having, after being calcined at least at 800 °C for 8 hours, a specific surface area of at least 85 m<sup>2</sup>/g.*

According to a further aspect, a precursor according to the present invention is defined by claim 7:

*7. Precursor composition for a zinc aluminate, comprising compounds of zinc and aluminum which are capable of forming, after being calcined, a zinc aluminate, said aluminate having, after being calcined at least at 800 °C for 8 hours, a specific surface area of at least 85 m<sup>2</sup>/g.*

*Schoenthal et al.* fails to disclose, or even suggest, the requirements of the presently claimed invention.

*Schoenthal et al.* is directed to a methanol synthesis catalyst based on zinc aluminate which is formed by precipitation of salts of aluminum and zinc. As explicitly admitted on page 4 of the Official Action: "Schoenthal does not teach the exact calcining temperature and times of the instant claims."

It is further alleged in the grounds for rejection that: "The taught product has the instantly claimed surface area. . . ." This assertion is respectfully traversed.

As readily apparent from the above, claims 1 and 7 require a material which possesses a thermal stability property such that it exhibits a specific surface area of at least 85 m<sup>2</sup>/g, even after being exposed to temperatures of at least 800°C for 8 hours.

Contrary to what is asserted in the grounds for rejection, *Schoenthal et al.* clearly fails to disclose, or even suggest, a catalyst material having the surface area stability required by the presently claimed invention. In fact, what little teaching can be gleaned from the disclosure of *Schoenthal et al.* in this regard, suggests otherwise. In particular, as clearly stated on lines 50-59 of column 5 of *Schoenthal et al.*, a material formed according to the teachings described therein which is calcined at 300°C for 4 hours exhibits a surface area of 108 m/g. However, the calcining conditions are nowhere near that required by the presently claimed invention. As further evidence that in fact the surface area of the material disclosed in *Schoenthal et al.* lacks the thermal stability of the material of the presently claimed invention, reference is made to Example 1, as described on pages 13-14

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of the present specification. As indicated on lines 2-3 of page 14 of the present specification, a material formed consistent with the principles of the present invention exhibits a specific surface area of 136 m<sup>2</sup>/g after calcining for 6 hours at 600°C. In other words, a material formed according to the principles of the present invention has a greater surface area than the material of *Schoenthal et al.*, even after being calcined at a temperature which is twice as high, and for a period which greatly exceeds the length of time described in Example 1 of *Schoenthal et al.*

Thus, for at least the reasons noted above, reconsideration and withdrawal of the rejection is respectfully requested.

Claims 2-6 depend from claim 1. Thus, these claims are also distinguishable over the teachings of *Schoenthal et al.* for at least the same reasons noted above.

→ Claims 1-10 and 12-20 stand rejected under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 5,227,145 to Kintaichi et al. (hereafter "*Kintaichi et al.*") in view of Chemical Abstracts No. 115:77073b (hereafter "*Chemical Abstracts*") on the grounds set forth on pages 5-6 of the Official Action. This rejection is respectfully traversed.

*Kintaichi et al.* discloses a process for removing nitrogen oxides from exhaust gases. The process described therein includes the use of catalyst materials selected from a polyvalent metal phosphate, a polyvalent metal sulfate or an aluminate of a transition metal of the Fourth Group of the Periodic Table. As explicitly admitted on page 5 of the Official Action: "The Kintaichi reference lacks the specific teaching of the instant surface area as taught in the instant claims."

The *Chemical Abstracts* article is cited as allegedly teaching the use of a zinc aluminate catalyst material having a "high surface area of 290 m<sup>2</sup>/g." This assertion is respectfully traversed.

As already explained in connection with the first grounds for rejection, the presently claimed invention does not simply require a catalyst material having a high surface area.

The presently claimed invention is directed to a material which has a surface area that is

→ thermally stable. In this regard, claims 1 and 7 of the instant application requires a material having a surface area of at least 85 m<sup>2</sup>/g, even after exposure to temperatures of at least 800°C for 8 hours. Contrary to what is asserted in the grounds for rejection, the *Chemical Abstracts* article is entirely devoid of any suggestion. In fact, the *Chemical Abstracts* article teaches away from the presently claimed invention.

The *Chemical Abstracts* article expressly teaches that:

The Zn aluminate maintained its large surface area to relatively high temps. ( $\leq 700^{\circ}$ ). Therefore it has potential use for catalyst materials.

By contrast, the material of the presently claimed invention maintains its surface area stability of its surface area temperature of at least 800°C (claim 1) and even as high as 1000°C (claims 4 and 5). Thus, the explicit teachings of the *Chemical Abstracts* article suggest that it lacks thermal stability at any temperature above 700°C. Thus, one of ordinary skill in the art would not have expected the reported surface area of 290 m<sup>2</sup>/g to be maintained under the conditions required by the presently claimed invention. To the

no but the  
instant claims  
have SA of more  
than 50 m<sup>2</sup>/g  
which may be  
290 m<sup>2</sup>/g

contrary, one of ordinary skill in the art would have <sup>NO</sup>expected the surface area to degrade at 700°C and above in light of the teachings of the *Chemical Abstracts* article.

Thus, for at least the reasons noted above, reconsideration and withdrawal of the rejection is respectfully requested.

Claims 2-10 and 12-20 depend from claim 1 or claim 7. Thus, these claims are also distinguishable over the applied prior art for at least the same reasons noted above.

#### ***ALLOWABLE SUBJECT MATTER***

Applicants note with appreciation the indication that claim 11 is allowed over the cited prior art. The reasons given for the indication of allowable subject matter are stated on page 6 of the Official Action:

The instant claim 11 requires a process using a zinc salt, 'sol' or 'alkoxide' and an aluminum alkoxide. This mixture is hydrolyzed and thus forms a precursor composition, which may be calcined to form the aluminate.

It is noted, however, that claim 10 also recites a process having steps essentially the same as those quoted above, which are apparently indicated as being the basis of allowable subject matter in claim 11. Thus, applicants respectfully submit that claim 10 is also allowable over the applied prior art for similar reasons. For at least this additional reason, reconsideration and withdrawal of the rejection of claim 10 is respectfully requested.

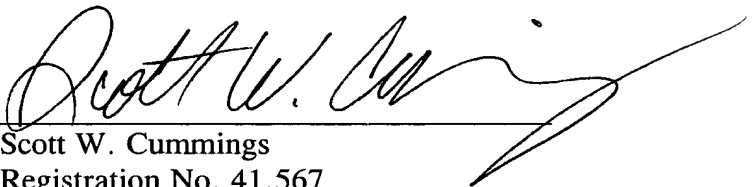


**CONCLUSION**

From the foregoing, further and favorable action in the form of a Notice of Allowance is earnestly solicited. Should the Examiner feel that any issues remain, it is requested that the undersigned be contacted so that any such issues may be adequately addressed and prosecution of the instant application expedited.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

By:   
Scott W. Cummings  
Registration No. 41,567

P.O. Box 1404  
Alexandria, Virginia 22313-1404  
(703) 836-6620

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